



FLORENCE COPPER PROJECT PRODUCTION TEST FACILITY

M57-O WELL CONSTRUCTION AND ABANDONMENT PROCEDURES

Prepared for:

U.S. EPA Region 9
75 Hawthorne Street (SFD-8-2)
San Francisco, CA 94105

Prepared by:

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January 2019

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1 INTRODUCTION

Florence Copper Inc. (Florence Copper) is currently operating the Production Test Facility (PTF) at the Florence Copper Project in Florence, Arizona. In accordance with the site Underground Injection Control (UIC) Permit No. R9UIC-AZ3-FY11-1 (Permit) and the *Conditional Authorization to Commence Injection for the Production Test Facility, UIC Permit No. R9UIC-AZ3-FY11-1* letter dated 14 December 2018, Florence Copper will abandon and replace well M57-O with well M57-O(R) located approximately 150 feet south of the existing well. This document describes procedures for abandonment and replacement of monitor well M57-O. The replacement well will be drilled and tested prior to abandonment of the existing monitor well.

After completion and development of M57-O(R), the well will be equipped with a dedicated QED MicroPurge pump for sampling. Appendix A shows the proposed well design and Appendix B shows the proposed well location. Appendix C includes the United States Environmental Protection Agency Plugging and Abandonment Plans.

The proposed well design was based on the lithologic contacts observed at the existing well M57-O. If the contacts vary, the well design will be modified prior to installation in order to ensure a cement seal is installed across the bedrock exclusion zone.

2 WELL ABANDONMENT

Well M57-O will be filled from the total depth to 5 feet below land surface (bls) with Type V neat cement grout. The blank casing will be perforated between 200 feet and the top of screen at 523 feet. Type V neat cement grout will be placed via tremie pipe; during grouting, the tremie pipe will remain submerged.

Perforation of the well casing will be conducted using the blast perforation method. Tremie pipe will be installed to the targeted depth for grout installation. Explosive charges will then be set inside the well casing at the specified perforation interval by a certified blasting technician. The well casing will be filled with Type V neat cement grout via submerged tremie pipe. As the well casing is filled with cement grout, the tremie pipe will be removed but will remain submerged. Once grout has reached ground surface and all tremie has been removed, the explosives will be detonated, perforating the casing and forcing wet grout into any voids behind the casing. Once the blast is cleared, the well will be topped off with Type V neat cement grout to 5 feet bls. The monument and the top 5 feet of the well will then be mechanically removed and backfilled with native material.

An abandonment diagram for well M57-O is included in the Plugging and Abandonment Plan in Appendix C.

3 WELL CONSTRUCTION

Well construction descriptions provided below include details of drilling; open-hole geophysics; casing, screen, and filter pack installation; and cementing.

3.1 Borehole Drilling

Borehole drilling consists of drilling a 20-inch diameter borehole to a minimum depth of 40 feet, then drilling a 12¼-inch borehole from the bottom of the surface casing to a minimum of 1,210 feet bls. The surface casing boring will be drilled using the auger or rotary method, and will be installed with the top of the surface casing above land to accommodate the mud-rotary drilling equipment. The annular seal will consist of Type V neat cement grout installed in the annulus between the surface casing and the borehole using the tremie method. The surface annular seal will extend from the land surface to the total depth of the surface casing.

The borehole in which the well will be constructed will be drilled from the bottom of the surface casing borehole to a minimum of 1,210 feet using the direct mud rotary or reverse circulation mud rotary drilling method, as conditions require. The well boring will be 12¼ inches in diameter.

3.2 *Open-Borehole Geophysics*

Open-hole geophysical logs will be run for the purpose of depth control and detection of borehole anomalies. Geophysical tools will include caliper, gamma-ray, temperature, directional survey, and electrical logs in accordance with the Permit.

3.3 *Well Casing Installation*

The well will consist of nominal 5-inch diameter blank casing material in the upper part of the well from land surface to a minimum of 40 feet below the top of bedrock. The blank casing will consist of Schedule 40 mild steel with either threaded or welded ends. Screen materials will be nominal 5-inch diameter Schedule 80 polyvinyl chloride with 0.020-inch slot openings. The end cap will be stainless steel.

During installation of the well casing and screen, the borehole will be kept full of drilling fluid and free of any obstructions detrimental to completing casing installation. The well casing and screen will be centered in the hole so as not to interfere in any way with the well installation. Casing installation will continue on a 24-hour per day, 7-day per week basis until completed.

Casing centralizers will be secured to the well casing and screen at 40-foot intervals, as shown in Appendix A. The casing and screen will be hung in tension, centered in the borehole, until all annular material has been installed.

Prior to installation of the casing, tremie pipe will be installed into the borehole. The tremie pipe will stay in place during casing installation and then will be used to place filter pack, annular seal materials, and cement within the annular space between the well casing and screen and the borehole wall. The tremie pipe will be removed from the well as construction and sealing operations are completed.

3.4 *Filter Pack and Intermediate Seal Installation*

Drilling fluid will be maintained throughout the full depth of the borehole to land surface, and the well casing and screen will be hung in tension until the filter material placement has been completed to the specified level, while the filter pack and intermediate seal materials are installed. During the time of placement, a rubber-flanged swab block will be used to swab the inside of the well screen in order to prevent bridging and aid in the settling of the filter pack in the borehole.

Filter pack will be placed to continuously fill the annulus to the specified level. Filter pack will be installed by use of the tremie pipe. At no time will the bottom of the tremie pipe be located at a distance of greater than 60 feet above the interval being filled during placement. Materials will be placed in accordance with the well design included in Appendix A.

The tremie pipe will be moved upward during installation of this interval, until the filter pack is installed above the uppermost well screen interval. The level of the filter pack will be measured periodically during placement with a wireline sounder. Placement of the materials will be continuous, except when additional precautions are necessary to prevent bridging or when measurements of the level are being conducted. The quantity of materials placed in the annulus will not be less than that of the computed volume.

The same tremie pipe will then be utilized for cementing the upper portion of the well casing as described below.

3.5 *Cementing*

The borehole for M57-O(R) will be of a constant diameter, drilled in a single stage. Once the well casing, screen, and filter pack have been installed in the boring, cementing of the upper portion of the well casing, from the bottom of the design interval to ground surface, will be accomplished by pumping a cement slurry down a tremie pipe positioned with the pipe's lower end near the bottom of the exclusion zone, forcing the cement to fill the annular space between the borehole and casing from the bottom up to the surface.

Cement grout will be placed to completely fill the well annulus within the specified interval. Prior to pumping, the cement grout will be passed through a ½-inch slotted bar strainer in order to remove any unmixed lumps. The discharge end of the tremie pipe will be continuously submerged in the grout until the zone to be grouted is completely filled.

The well casing will be hung in tension until the cement grout has cured. The well casing will be filled with a fluid of sufficient density to maintain an equalization of pressures to prevent collapse of the well casing during cementing.

Cement will consist of sulfate-resistant Portland Type V cement.

Water and/or appropriate mud-breaker chemicals will be circulated through the tremie pipe prior to cementing to reduce drilling mud viscosity and assist in removal of mud from the borehole-casing annulus.

The cement slurry will be pumped at the greatest flow rate possible to promote removal of drill mud from the annular space and enhance bonding between the cement and the casing and formation. An excess quantity of cement will be pumped into the annular space in order to verify "clean" cement slurry returns from the well prior to terminating the cementing procedure. Following installation of the cement slurry, the cement will be allowed to cure for a minimum of 24 hours before performing additional operations on the well.

3.6 *Mechanical Integrity Demonstration*

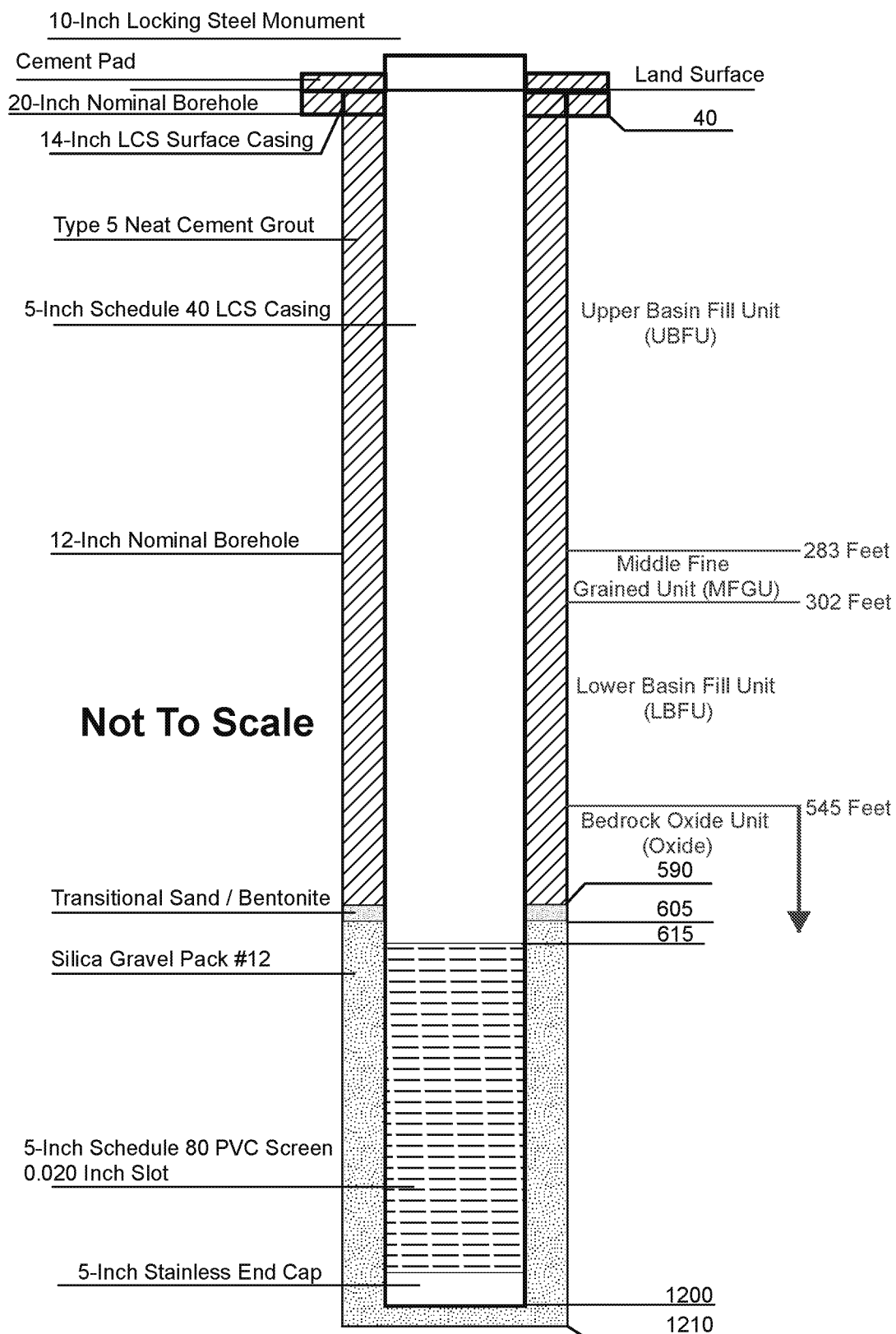
Upon completion of M57-O(R), Mechanical Integrity demonstration will be conducted and reported in accordance with the Permit conditions.

4 *PROPOSED CHANGES*

Florence Copper will give advance notice to the Director, as soon as possible, of any planned alterations or additions to this plan.

APPENDIX A

M57-O(R) Proposed Well Design



Appendix A. M57-O (R) Proposed Well Design



**FLORENCE
COPPER**

CLIENT: Florence Copper

PROJECT: PTF

JOB: M57-O SCALE: NOT TO SCALE

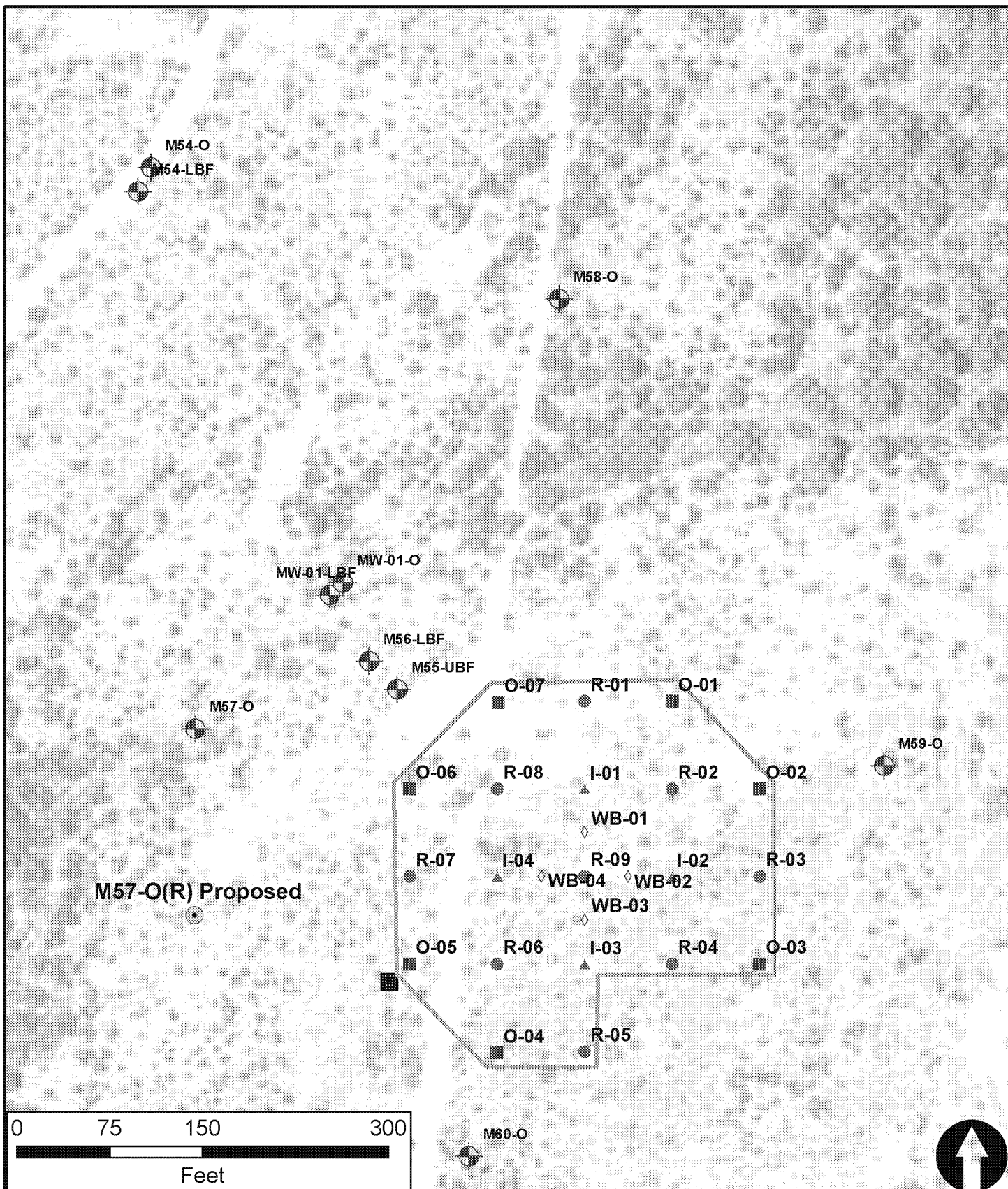
DRAWN: IR CHECKED: DJ

DATE: November 2018

FIGURE: A

APPENDIX B

Proposed Location of M57-O(R)



Appendix B. Proposed Location of M57-O(R)



**FLORENCE
COPPER**

CLIENT: Florence Copper

PROJECT: PTF

JOB: M57-O(R) SCALE: 1:1,300

DRAWN: IR CHECKED: DJ

DATE: 12/26/1018

FIGURE: B

APPENDIX C

Plugging and Abandonment Plans



United States Environmental Protection Agency
Washington, DC 20460

PLUGGING AND ABANDONMENT PLAN

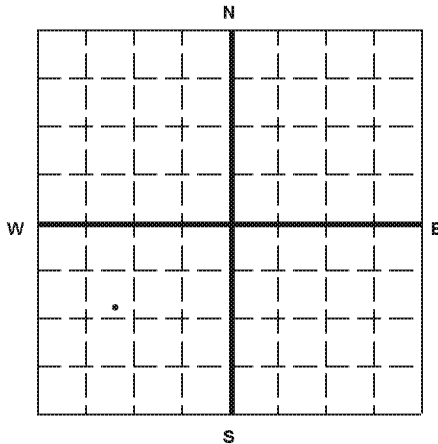
Name and Address of Facility

Florence Copper Project
1575 W Hunt Hwy, Florence AZ 85132

Name and Address of Owner/Operator

Florence Copper
1575 W Hunt Hwy, Florence AZ 85132

Locate Well and Outline Unit on Section Plat - 640 Acres



State

Arizona

County

Pinal

Permit Number

AZ396000001

Surface Location Description

SE 1/4 of SE 1/4 of NW 1/4 of SW 1/4 of Section 28 Township 4S Range 9E

Locate well in two directions from nearest lines of quarter section and drilling unit

Surface

Location 1115 ft. from (N/S) N Line of quarter section
and 1073 ft. from (E/W) W Line of quarter section.

TYPE OF AUTHORIZATION

- ☐ Individual Permit
☒ Area Permit
☐ Rule

Number of Wells 1

WELL ACTIVITY

- ☐ CLASS I
☐ CLASS II
☐ Brine Disposal
☐ Enhanced Recovery
☐ Hydrocarbon Storage
☒ CLASS III

Lease Name NA

Well Number M57-OR

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT (LB/FT)	TO BE PUT IN WELL (FT)	TO BE LEFT IN WELL (FT)	HOLE SIZE
14	36.71	40	40	20
5	14.63	615	615	12
5	2.73	585	585	12

METHOD OF EMPLACEMENT OF CEMENT PLUGS

- ☒ The Balance Method
☐ The Dump Bailer Method
☐ The Two-Plug Method
☐ Other

CEMENTING TO PLUG AND ABANDON DATA:

	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7
Size of Hole or Pipe in which Plug Will Be Placed (inches)	5						
Depth to Bottom of Tubing or Drill Pipe (ft)	1200						
Sacks of Cement To Be Used (each plug)	126						
Slurry Volume To Be Pumped (cu. ft.)	163.5						
Calculated Top of Plug (ft.)	0						
Measured Top of Plug (if tagged ft.)	NA						
Slurry Wt. (Lb./Gal.)	15.4						
Type Cement or Other Material (Class III)	V						

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED (if any)

From	To	From	To
615	1200		

Estimated Cost to Plug Wells

12,500

Certification

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32)

Name and Official Title (Please type or print)

Signature

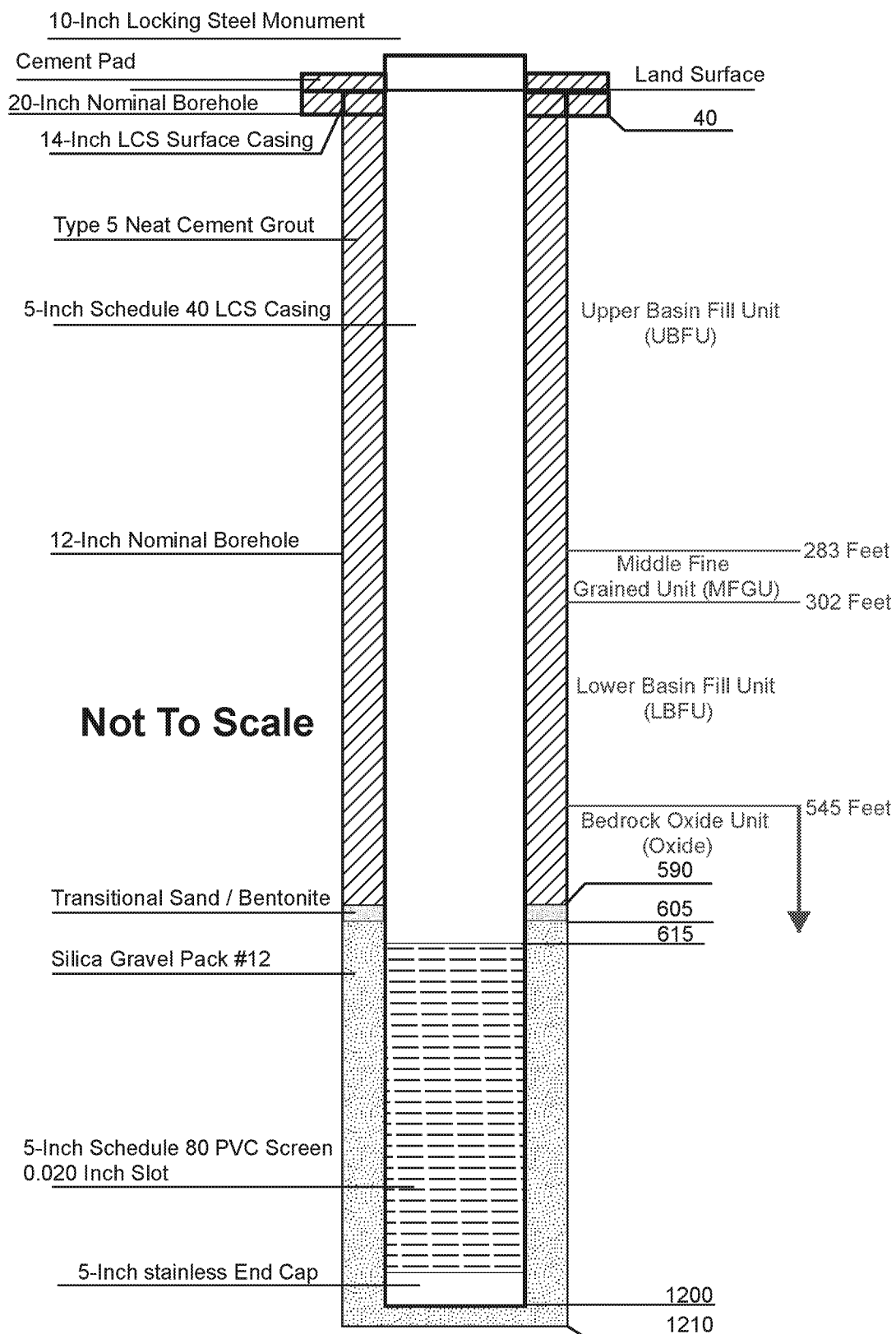
Date Signed

Paperwork Reduction Act Notice

The public reporting and record keeping burden for this collection of information is estimated to average 4.5 hours for operators of Class I hazardous wells, 1.5 hours for operators of Class I non-hazardous wells, 3 hours for operators of Class II wells, and 1.5 hours for operators of Class III wells.

Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to the collection of information; search data sources; complete and review the collection of information; and, transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations are listed in 40 CFR Part 9 and 48 CFR Chapter 15.

Please send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including the use of automated collection techniques to Director, Office of Environmental Information, Collection Strategies Division, U.S. Environmental Protection Agency (2822), Ariel Rios Building, 1200 Pennsylvania Ave., NW., Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, NW., Washington, DC 20503, Attention: Desk Officer for EPA. Please include the EPA ICR number and OMB control number in any correspondence.



**FLORENCE
COPPER INC.**

M57-O (R) Proposed Well Design

CLIENT: Florence Copper

PROJECT: PTF

JOB: M57-O SCALE: NOT TO SCALE

DRAWN: IR CHECKED: DJ

DATE: November 2018

FIGURE: X



United States Environmental Protection Agency
Washington, DC 20460

PLUGGING AND ABANDONMENT PLAN

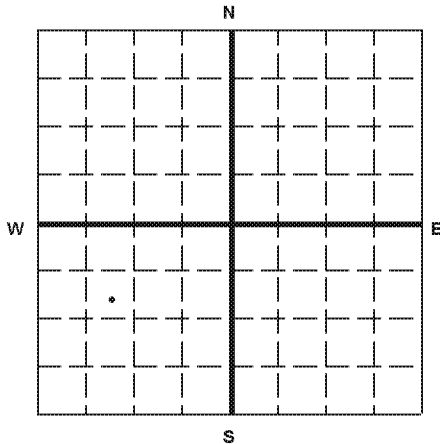
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1575 W Hunt Hwy, Florence AZ 85132

Locate Well and Outline Unit on Section Plat - 640 Acres



State

Arizona

County

Pinal

Permit Number

AZ396000001

Surface Location Description

NE 1/4 of SE 1/4 of NW 1/4 of SW 1/4 of Section 28 Township 4S Range 9E

Locate well in two directions from nearest lines of quarter section and drilling unit

Surface

Location 960 ft. frm (N/S) N Line of quarter section
and 1265 ft. from (E/W) W Line of quarter section.

TYPE OF AUTHORIZATION

- ☐ Individual Permit
☒ Area Permit
☐ Rule

Number of Wells 1

WELL ACTIVITY

- ☐ CLASS I
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☒ CLASS III

Lease Name NA

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CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT (LB/FT)	TO BE PUT IN WELL (FT)	TO BE LEFT IN WELL (FT)	HOLE SIZE
14	36.71	40	40	17.5
5	14.63	523	523	10.625
5	2.73	676	676	10.625

METHOD OF EMPLACEMENT OF CEMENT PLUGS

- ☒ The Balance Method
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☐ The Two-Plug Method
☐ Other

CEMENTING TO PLUG AND ABANDON DATA:

	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7
Size of Hole or Pipe in which Plug Will Be Placed (inches)	5						
Depth to Bottom of Tubing or Drill Pipe (ft)	1199						
Sacks of Cement To Be Used (each plug)	126						
Slurry Volume To Be Pumped (cu. ft.)	163						
Calculated Top of Plug (ft.)	5						
Measured Top of Plug (if tagged ft.)	NA						
Slurry Wt. (Lb./Gal.)	15.4						
Type Cement or Other Material (Class III)	V						

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED (if any)

From	To	From	To
523	1199		
200	523		

Estimated Cost to Plug Wells

12,500

Certification

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Name and Official Title (Please type or print)

Signature

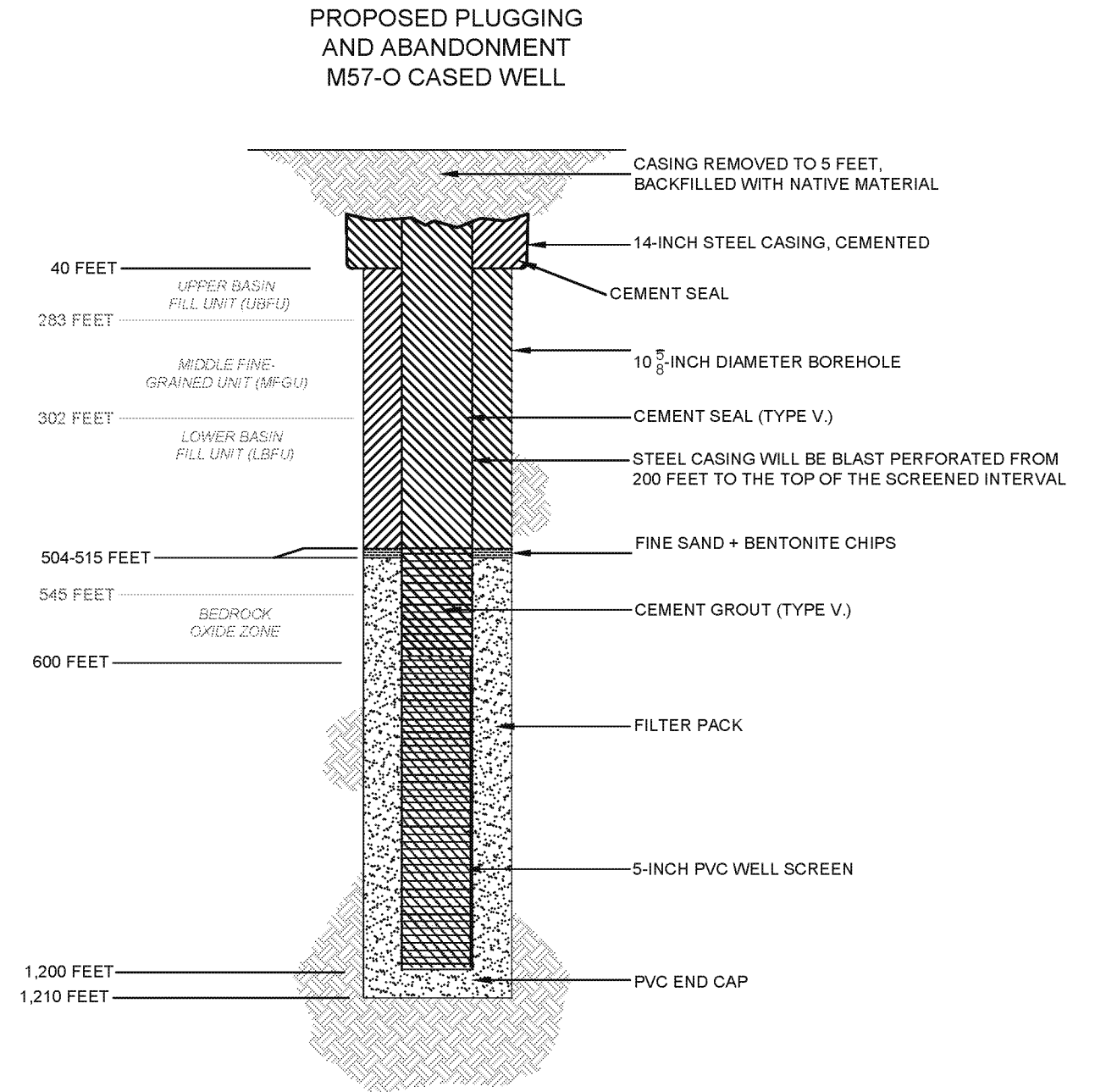
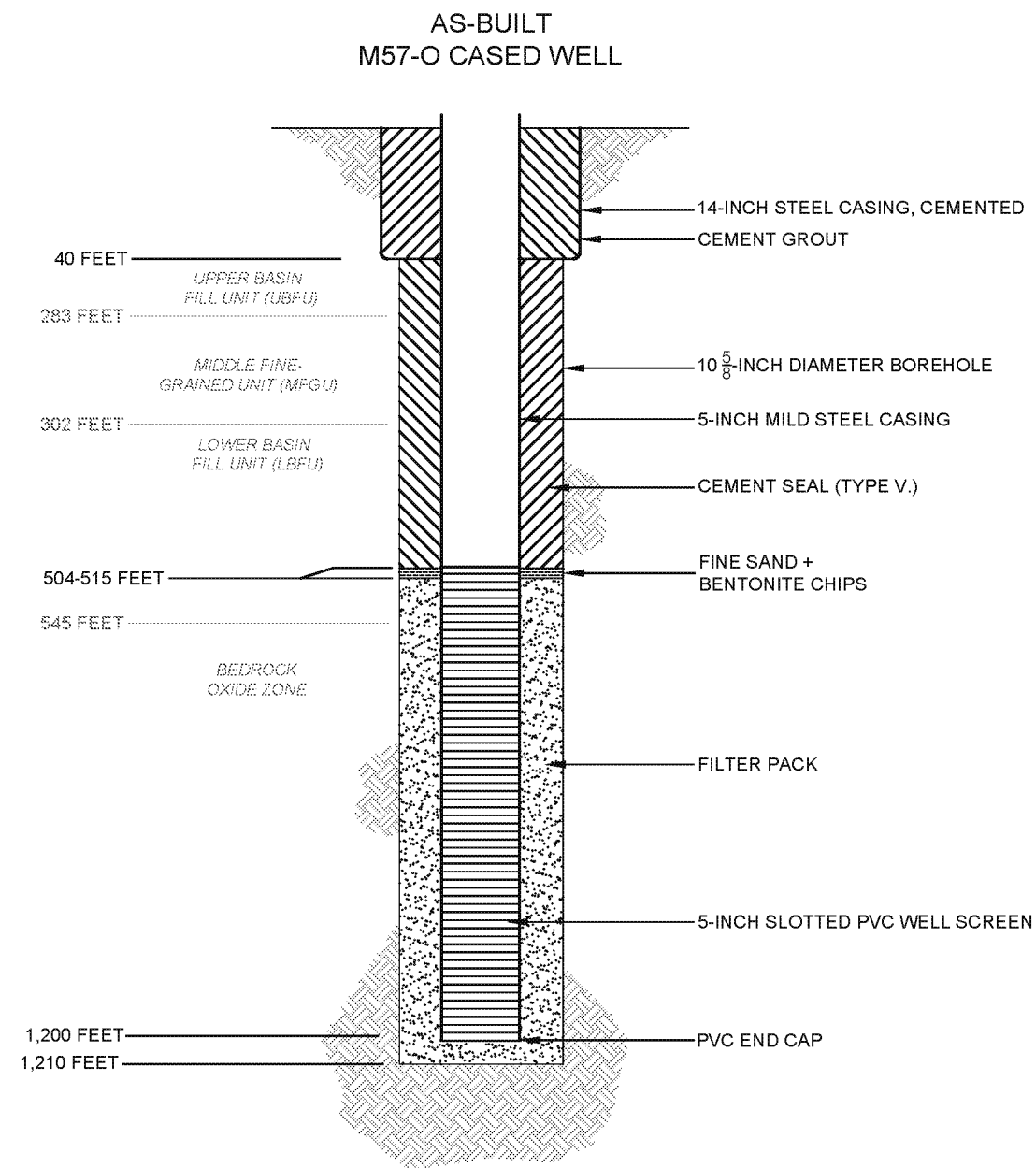
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**HALEY
ALDRICH**

FLORENCE COPPER, INC.
PRODUCTION TEST FACILITY
FLORENCE, ARIZONA

**M57-O WELL ABANDONMENT
DIAGRAM**

**FLORENCE
COPPER INC.**

SCALE: AS SHOWN
DECEMBER 2018

FIGURE 1